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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/390,389	09/03/1999	HUI-LING LOU	13-13	6784

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EXAMINER
BURD, KEVIN MICHAEL

ART UNIT	PAPER NUMBER
2631	

DATE MAILED: 12/09/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/390,389	Applicant(s) LOU ET AL
	Examiner Kevin Burd	Art Unit 2631

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *Dec 2, 2002* .

2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above, claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-25* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 10
4) ☐ Interview Summary (PTO-413) Paper No(s). _____
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

1. This office action, in response to the request for reconsideration filed 12/2/2002, is a non-final office action.

Response to Arguments

2. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

3. Applicant's arguments with respect to claims 1-25 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seshadri et al (US 5,289,501) in view of the instant application's disclosed prior art, Durant et al, "Implementation of a Broadband Equalizer for high-Speed Wireless Data

Communications" and Ariyavisitakul et al, "Reduced-Complexity Equalization Techniques for Broadband Wireless Channels".

Regarding claims 1, 12 and 23-25, Seshadri discloses a method of processing received data in a digital communication system. Figure 3 discloses a standard two-dimensional data transmission constellation used in digital cellular mobile radio. Data words comprise two information bits which are mapped into one of four possible two dimensional channel symbols. The phase angle of each signal point indicates a change that the phase of the transmitted signal must undergo in order to transmit that bit pattern associated with the particular signal point. A scheme which rotates the entire constellation by 45 degrees can be used (column 4, line 64 to column 5 line 30). When the standard constellation with the constellation points shown on figure 3 is rotated by 45 degrees, the constellation points now fail on the real and imaginary axis. The signal points are now either all real or all imaginary. The processing of these symbol points is not as complex as before since multiplications can be preformed as add/sub operations as stated in the instant application's disclosed prior art on page 6 in reference to G.M. Durant and S. Ariyavisitakul, "Implementation of a broadband equalizer for high-speed wireless data applications," Proc. IEEE ICUPU 98, Florence, Italy, OCT. 1998. Durant further states in the next sentence, "Reference [2] contains a detailed proof of this structure's equivalence with the conventional DFE." Reference [2] is found on page 1020 and is S. Ariyavisitakul et al, "Reduced-complexity equalization techniques for

broadband wireless channels," IEEE Journals of Selected Areas in Communications, vol. 15, pp 5-15, January 1997. On page 14 of the S. Ariyavisitakul et al reference, Table 1 is disclosed which shows the comparison of complexity of the conventional DFE and the Modified DFE. This table discloses the number of operations is greatly reduced. The S. Ariyavisitakul et al reference is provided to prove the instant application's disclosed prior art statement that the processing of these symbol points is not as complex as before. Seshadri discloses the act of rotating the constellation and the instant application discloses an additional advantage of this rotation. By combining the teachings of the instant application's disclosed prior art, Durant and Ariyavisitakul for eliminating the multipliers and replacing them with add/sub operations into the digital cellular mobile radio system of Seshadri complexity of the system can be reduced thereby saving on cost of the device. For there reasons, it would have been obvious for one of ordinary skill in the art at the time of the invention to combine the instant application's disclosed prior art with Seshadri.

Regarding claims 2 and 13, as stated above, the instant application's disclosed prior art states the multiplication operations can be performed as add/sub operations (page 6).

Regarding claims 3 and 14, as stated above, Seshadri discloses the constellation is rotated by 45 degrees.

Regarding claims 4 and 15, Seshadri discloses $\pi/4$ shifted DPSK or PSK constellations are used in column 5, lines 1-25.

Regarding claims 5 and 16, Seshadri discloses the maximum likelihood or Viterbi decoding is well known and used in the digital radio arts (column 3, lines 29-51).

Regarding claims 6-8 and 17-19, the constellation points, shown in figure 3 of Seshadri, prior to rotation, will have both imaginary and real components. After the points are rotated, both real and imaginary parts are output. One of the real or imaginary components will be equal to zero and allow the complexity of the multiplication to be reduced by using add/sub operations as stated in the prior art. These operations will become activated when appropriate.

Regarding claims 9 and 20, the combination discloses above does not disclose the act of filtering a signal using an FIR filter. It is well known in the art that the FIR filter allows certain unwanted components of a received signal to be eliminated so only desired components of a signal remain. It would have been obvious for one of ordinary skill in the art at the time of the invention to eliminate unnecessary components of a signal from being processed with the desired components.

Regarding claims 10, 11, 21 and 22, the combination discloses above does not disclose the use of multipliers. However, it is well known in the art that multiplication can be conducted without the need of using multipliers. The equation 2 * 3 is simply 2 + 2 + 2. The adder method will save time since the complexity of the equation in binary form

is much simpler than multiplication however numerous steps are needed. Therefore, it would have been obvious for one of ordinary skill in the art at the time of the invention to utilize the adder method to eliminate the complexity of the equation to save time on the computation.

Contact Information

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
Washington, D.C. 20231

or faxed to:

(703) 872-9314, (for formal communications intended for entry or for informal or draft communications, please label "PROPOSED" or "DRAFT")

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington. VA., Sixth Floor (Receptionist).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Burd, whose telephone number is (703) 308-7034. The Examiner can normally be reached on Monday-Thursday from 9:00 AM - 6:00 PM.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 305-3800.

CHI PHAM
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600 12/5/02

Kevin M. Burd
PATENT EXAMINER
December 4, 2002